NATURAL RESOURCES PROGRAM

SPACE APPLICATIONS PROGRAMS

TECHNICAL LETTER NASA-23

U.S. Geological Survey

Department of the Interior

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON, D.C. 20242

Technical Letter
NASA-23
June 1966

Dr. Peter C. Badgley
Chief, Natural Resources Program
Office of Space Science and Applications
Code SAR, NASA Headquarters
Washington, D. C. 20546

Dear Peter:

Transmitted herewith are 3 copies of:

TECHNICAL LETTER NASA-23

GEOLOGIC APPRAISAL OF RADAR IMAGERY OF

SOUTHWESTERN OREGON*

by

William P. Irwin**

Sincerely yours,

W A Fischer

William A. Fischer
Research Coordinator for
USGS/NASA Natural Resources Program

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**U.S. Geological Survey, Menlo Park, California

UNITED STATES
DEPARTMENT OF THE INTERIOR
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GEOLOGIC APPRAISAL OF RADAR IMAGERY OF SOUTHWESTERN OREGON

by

William P. Irwin

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This report pertains to radar imagery obtained along the western part of flight no. 96, October 25, 1965. This part of the flight, extending from near Grants Pass, Oregon, to the coast, was along a path bearing about N. 80 W. and nearly 60 miles in length. The linear scale of the radar imagery, measured parallel to the flight path, is 1 inch equals approximately 2.8 miles. The eastern part of the imagery is of the Klamath Mountains geologic province, and the western part is of the Coast Ranges.

author

In general the radar images show features similar to what one might expect to see on conventional photographs at the same scale. The most obvious geologic features are essentially straight-line lineaments. The dominant lineaments in the Klamath Mountains portion of the photo trend northeast, parallel to the lithic and structural grain of the province (fig. 1). In the Coast Range province, the dominant lineaments seen in the radar imagery trend northwest adjacent to the coastline, again parallel to the known lithic and structural trends (fig. 2). An unexpected feature seen on the radar imagery is a series of lineaments that trend nearly east-west across both provinces. As with many conventional aerial photographs, a multitude of other lineaments can be seen that are not readily interpreted on the basis of known lithic or structural features.

The area crossed by the flight path consists of a complex of various kinds of rocks, including sedimentary, volcanic, plutonic and metamorphic. However, the reflectivity does not seem to differ sufficiently for these various rock types to be outlined reliably on the radar imagery. The only rock unit that could be outlined reliably is a large granitic pluton (fig. 1) in the vicinity of Grants Pass, and this was outlined chiefly on the basis of a topographic pattern of fine dissection rather than on reflectivity.

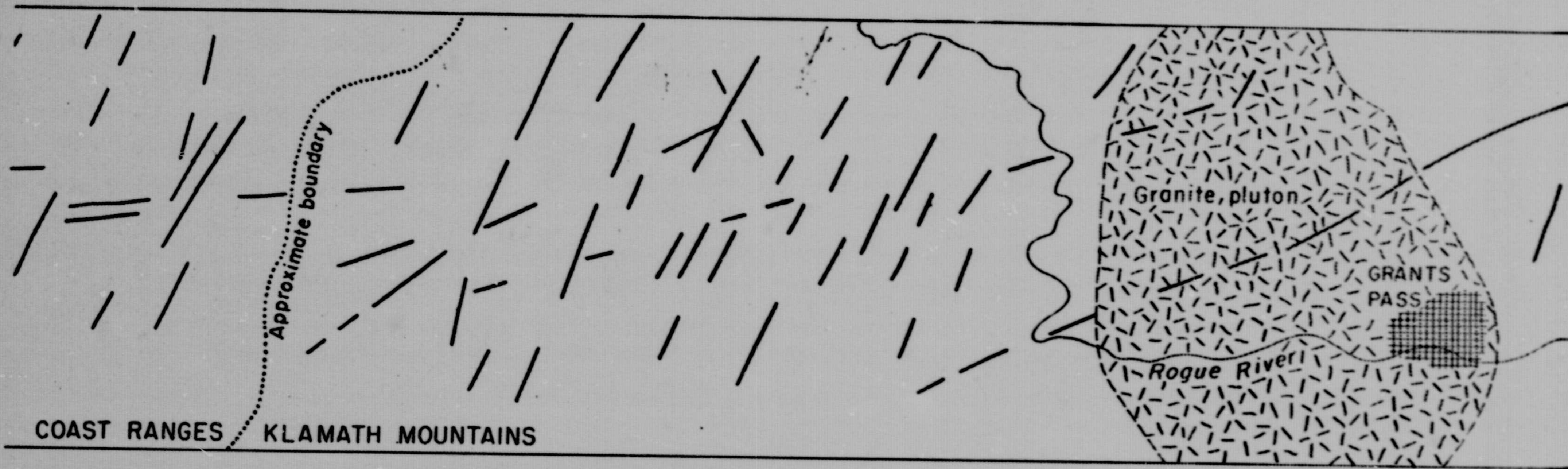
Reliable comparison of radar imagery to conventional aerial photographs is not feasible without having available both kinds of photography at the same scale. However, the radar seems to see through vegetation, and thus there are obvious benefits to be gained by use of radar in forested areas with regard to seeing topography in greater detail and in seeing geologic features that can be located or interpreted on the basis of detailed topography. The ability of radar to ignore the vegetation may be a mixed blessing when radar imagery photos is used for geologic interpretation, as the differences in vegetation are in many cases used in photo geology to assist in distinguishing between rock units.

The two parallel images on each strip are of unequal density (or contrast). Of the two, the polarized image seems the better, except where the effect of cloud cover is overcome in the depolarized image. The depolarized image might be improved by being printed in greater contrast.

Series of strips flown parallel for extended areal coverage should be made in the same direction to avoid a topographic reversal effect. Images from two essentially parallel E-W flights across southwestern Oregon were difficult to study side by side, as one had to be viewed as though looking south and the other looking north.

Radar imagery may have important application to regular geologic mapping projects in forested areas. Radar images at scales comparable to those normally used in geologic mapping should be appraised in field.

Figure 1. Sketch of eastern part of subject area, showing: (a) approximate boundary between Klamath Mountains and Coast Ranges; (b) pattern of principal structural lineaments seen on radar image; and (c) granitic pluton in vicinity of Grants Pass.



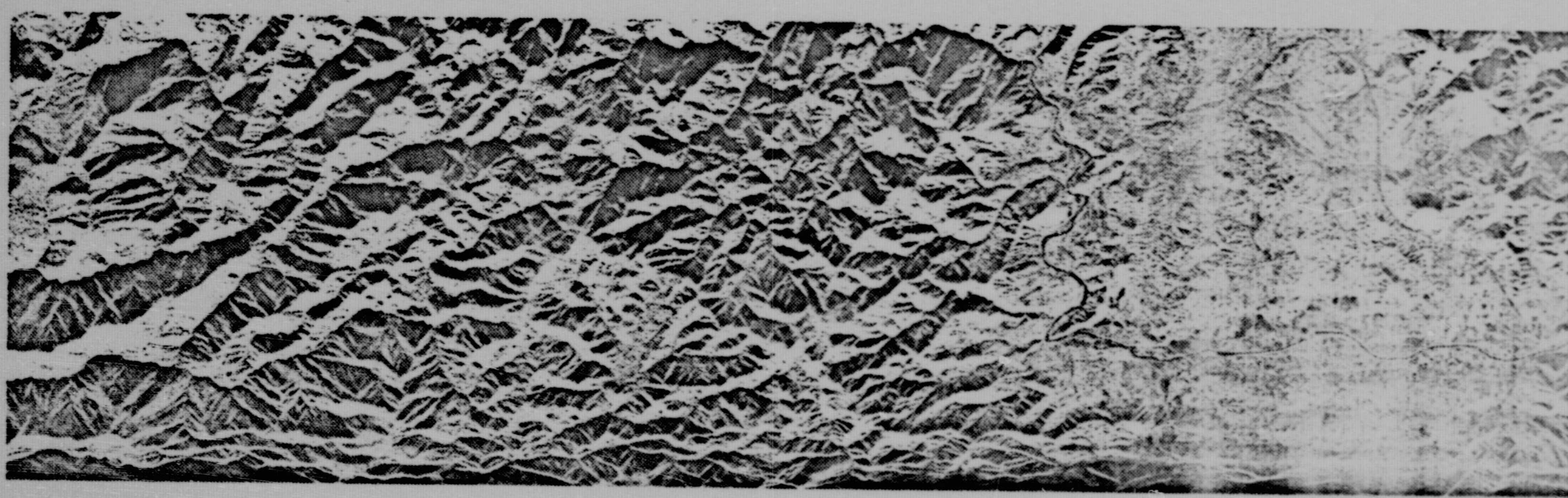


Figure 2. Sketch of western part of subject area (joins Figure 1 at west end) showing pattern of principal structural lineaments seen on radar image